DOCUMENT RESUME

ED 128 465 TM 005 658

AUTHOR	Virgin, A. E.; Darby, L. M.
TITLE	1974 Replication and Follow-Up of a Survey of Mathematics and Reading Skills.
INSTITUTION	North York Board of Education, Willowdale (Ontario).
PUB DATE	Apr 74
NOTE	29p.; For a related document, see TM 005 659
EDRS PRICE	MF-$0.83 HC-$2.06 Plus Postage.
DESCRIPTORS	Achievement Gains; *Achievement Tests; Comparative Analysis; Elementary School Mathematics; Elementary Secondary Education; *Followup Studies; *Mathematics; Reading Skills; *Reading Tests; Secondary School Mathematics; Statistical Analysis; *Testing Programs; Test Results
IDENTIFIERS	Metropolitan Achievement Test; Ontario (North York); School and College Ability Test; Sequential Tests of Educational Progress

ABSTRACT

In 1971, a comprehensive study was made of mathematics and reading achievement in the Borough of North York, Ontario. In 1974, a replication and followup study was carried out. The purposes of the study were to replicate the 1972 study, and to obtain a measure of growth in reading and mathematics achievement between grade 3 and grade 5, over the two year time period. In both years, the Metropolitan Achievement Test, the Sequential Tests of Educational Progress, and the School and College Ability Test were used. The results indicated that North York achievement in both reading and mathematics compared favorably with the American norms in all grades tested, and the average growth over the two years grade 3 to grade 5 was above that expected in both reading and mathematics. (Author/BW)

****
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
****

ED128465

RESEARCH REPORT

SCOPE OF INTEREST NOTICE
The ERIC Facility has assigned this document for processing to: TM CS
In our judgement, this document is also of interest to the clearinghouses noted to the right. Indexing should reflect their special points of view. SE

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

1974 REPLICATION AND FOLLOW-UP OF

A SURVEY OF MATHEMATICS AND READING SKILLS

A.E. Virgin
L.M. Darby

April, 1974

2

THE BOARD OF EDUCATION FOR THE BOROUGH OF NORTH YORK

TM005 658

TABLE OF CONTENTS

	Page Number
INTRODUCTION AND PROCEDURE	
Background	1
Purpose	1
Sample	1
Selection of Tests	2
- Metropolitan Achievement Tests	2
- Sequential Tests of Educational Progress	3
- School and College Ability Tests	3
Administration	4
Scoring and Analysis	5
RESULTS	
Section One: Reading Skills	6
Grade 3	6
Grade 5	9
Grade 6	10
Grade 9	11
Grade 12	13
Section Two: Mathematics Skills	15
Grade 3	15
Grade 5	17
Grade 6	18
Grade 9	20
Grade 12	23
SUMMARY	25

INTRODUCTION AND PROCEDURE

Background

In February, 1972, in response to a resolution passed by the Board of Education on June 28th., 1971, a comprehensive study was made of mathematics and reading achievement in the Borough of North York. In February, 1974, at the request of the Assistant Director of Education, a replication and follow-up of the 1972 survey was carried out.

Purpose

The purpose of the present study is two-fold:

(1) to replicate the study carried out in Spring, 1972 in which descriptive statistical information was gathered in the areas of reading and mathematics achievement from pupils in Grades 3, 6, 9 and 12 from across the borough,

(2) to obtain a measure of growth in reading and mathematics achievement between Grade 3 and Grade 5, over the two year time period.

Sample

In the replication phase, pupils in Grades 3, 6, 9 and 12 were selected from those schools that participated in the 1972 study. At the elementary level, pupils in the 27 schools were selected in two ways. In the small schools, all pupils at the two grade levels were included, while in the larger schools, two classes from each of the two grade levels were selected at random. At the junior high and secondary levels, a random sample of students in Grades 9 and 12 who are enrolled in both English and Mathematics programs were selected from enrollment lists supplied by Computer Services. Approximately sixty students at each grade level in each of the ten participating schools at each panel were selected in this manner. In the follow-up phase, two classes of Grade 5 pupils in each of the 27 participating elementary schools were selected to participate.

The table below summarizes the number of schools and corresponding number of students from whom test data were gathered at each level.

TABLE 1

Grade Level	Number of Schools	Number of Students
3	27	1450
5	27	1500
6	27	1540
9	10	585
12	10	530

The numbers from Grades 3, 5, 6 and 9 are close approximations, since the number present for each of the two testing sessions varied slightly. Also, on the sample, while 600 names were listed, the actual number of students at Grades 9 and 12 who attended the tests are as shown above.

Selection of Tests

To facilitate the desired comparisons, the tests selected for the 1972 survey were used again in the present survey. A description of these tests follows.

Metropolitan Achievement Test (MAT)

In the initial study, where the Metropolitan Achievement Test was used, two subtests measuring aspects of reading, and three subtests measuring mathematics, were administered. The results of that study indicated that there were high correlations (ranging from .7 - .9) between the subject related subtests, and therefore it was deemed unnecessary to give all five subtests.

The Reading Comprehension subtest was administered to Grades 3, 5, and 6. This consists of 45 items designed to measure pupils' ability to comprehend written material. Items cover comprehending literal meaning of passages, drawing inferences, identifying main ideas and determining word meanings from context.

The Mathematics Computation subtest was administered to Grades 3, 5, 6 and 9. This subtest contains 40 items covering basic arithmetic skills including decimals and fractions. The number of items used in each subtest is the same, with the difficulty of the items appropriate to the grade level for which it is intended.

On each of the subtests, the raw score is the total number of correct answers marked by each pupil. In order to allow for differences in length and difficulty among subtests, the raw score is converted, by means of a table, to a standard score. The standard score is then converted to a grade equivalent for purposes of analysis.

Sequential Tests of Educational Progress (STEP)

The reading test administered to Grades 9 and 12 is the Sequential Tests of Educational Progress (STEP). This test is designed to assess five major reading-for-comprehension skills, i.e. the abilities to reproduce ideas, to translate ideas and make inferences, to analyze motivation, to analyze presentation, and to criticize.

The items require identification of details, analysis, interpretation and criticism of passages such as newspaper and magazine articles, letters, stories, poetry, plays, essays, etc.

The test is divided into two parts, Vocabulary and Reading Comprehension: the number of correct responses determines the total reading score. To permit statistical comparisons this is changed to a "converted score". Converted scores can be easily translated into nationally normed (U.S.) percentile rankings.

School and College Ability Test (SCAT)

The SCAT is a series of aptitude tests designed to evaluate a student's capacity to perform verbal and mathematical skills. The quantitative portion of form 2A recommended for Grades 10 - 12 was administered to the Grade 12's. This portion of the test consists of 50 items involving various levels of computation and arithmetic reasoning. Each item involves the student in a multiple choice selection of the preferred answer to a mathematics question including geometry, simple algebra, graphs, number systems, etc.

The conversion of a student's raw score to a converted score and then to a percentile rank is similar to the method used in the STEP series.

To summarize, the tests that were given at each grade level are as follows:

Grade 3 Metropolitan Achievement Test, Elementary Form G.
Subtests - Reading Comprehension
Mathematics Computation.

Grade 5 & 6	Metropolitan Achievement Test, Intermediate Form F Subtests - Reading Comprehension Mathematics Computation
Grade 9	Metropolitan Achievement Test, Advanced Form F Subtest - Mathematics Computation Sequential Test of Education Progress (STEP) Series II, Form 3A Subtest - Reading
Grade 12	STEP, Series II, Form 2A Subtest - Reading School and College Ability Test (SCAT) Series II Form 2A Subtest - Quantitative

Administration

As a preliminary to the testing, an organizational session was held to orient the participating elementary school principals and teachers. Mr. C.G. Brown, Assistant Director of Education outlined the purpose of the present study, with reference to the original Mathematics and Reading Task Force survey. The gathering was then divided into four Area groups to distribute test materials and to discuss administrative procedures. The tests were administered by the teachers.

Following notification of their inclusion in the study, junior and senior high schools were visited by members of the Educational Research Services staff, and arrangements for testing were made cooperatively.

The tests were administered at each grade level according to the following schedule:

TABLE 2

Grade	No. of Sittings	No. of Days	Total Writing Time
3	2	2	60 minutes
5	2	2	60 minutes
6	2	2	60 minutes
9	2	1 or 2	80 minutes
12	1	1	65 minutes

All of the elementary teachers were given "Testing Environment" sheets on which they were asked to report (1) children's responsiveness to the test and (2) irregularities

in test administration, for each of the two testing sessions.

Ninety-five teachers returned the sheets, and analysis of the data suggests that the testing sessions went very well. Only five teachers reported any irregularities, such as interruptions or excessive noise, and these lasted only a few minutes.

All of the teachers of Grade 6 classes reported that their pupils' responsiveness to the test was good. Three Grade 5 teachers reported that some of their pupils found the Mathematics subtest somewhat confusing. In most of the Grade 3 classes, the children were relaxed and eager; however, about six teachers did report some anxiety on the part of their pupils, particularly in the mathematics subtest.

The test administrators from Educational Research Services reported a high degree of cooperation from the students at both junior and senior levels, although some restlessness was evident in two of the Grade 9 classes that were tested in the afternoon. The schools were generally cooperative and well-prepared for the testing sessions, although a somewhat 'laissez-faire' attitude toward the writing of the tests produced a smaller sample than requested in several of the Grade 12 classes.

Scoring and Analysis

In view of the considerable disparities cited in a recent Scarborough Research Report* between hand-scored and machine-scored reading tests, all of the elementary school tests were hand-scored and the results were recorded in a form suitable for key punching. Basic statistics (means and standard deviations)were calculated for each school, as well as the total sample at each grade level. The test booklets were subsequently returned to the teachers whose classes participated in the study.

All Grade 9 and 12 tests were recorded on computer cards which were then forwarded to the North York Computer Services Department for scoring and analysis.

---

* " ... there were statistically significant differences between the hand-and machine-scored groups (for grade six pupils)... on the test as a whole. In each case, this difference favoured the hand-scored group, to the extent that.... the hand-scored group mean was almost 10 points higher than the machine-scored group mean." DILLING, H.J., and FARRELL, M.A. An Investigation of Factors Related to Reading Achievement; June 28, 1973.

RESULTS

The results of the data analyses are discussed in two sections, Reading Skills and Mathematics Skills respectively. In each section, the results are presented separately for each of the five grade levels. At each grade level, the following information is reported for each subtest for both the 1972 and 1974 testing samples:

1. The number of pupils across the Borough for whom test data were gathered.
2. The mean score for North York.
3. The standard deviation of the scores.
4. Comparisons of the performance - levels of North York students in 1972 and 1974.
5. The range of mean scores from the participating schools, i.e. the school with the lowest mean and the school with the highest mean score.
6. Percentages of North York students at certain stages of achievement.

The reader will note that at the Grades 3, 5 and 6 levels, each pupil's raw score in reading was converted to a grade equivalent score. This is true also of the mathematics scores at the Grades 3, 5, 6, and 9 levels. For example, on the Grade 3 Reading Comprehension subtest, a pupil who answered 24 items correctly would have a corresponding grade equivalent score of 3.6. This means that the pupil is performing at a level which is typical for pupils in the seventh month of Grade 3. It is important that the reader note that a grade equivalent score of 5.2 for a Grade 3 pupil does not mean that this pupil should be regarded as a Grade 5 pupil and so ready to do Grade 5 work. Rather, it indicates that he should be considered considerably above average for Grade 3.

Section One: Reading Skills

Grade 3

The following table presents Borough mean grade equivalent scores and standard deviations for the Reading Comprehension subtest of the Metropolitan Achievement Test (MAT), administered to Grade 3 pupils in 1972 and 1974.

TABLE 3

MEAN GRADE EQUIVALENTS AND STANDARD DEVIATIONS FOR THE READING COMPREHENSION SUBTEST OF THE MAT GRADE 3 LEVEL

	North York Mean*	Standard Deviation**	Number Of Pupils	Range of School Means***
1972	3.4	1.4	1505	2.6 - 4.6
1974	3.3	1.3	1449	2.6 - 4.2

* The expected mean grade equivalent based on the time of testing is 3.5

** The standard deviation is a measure which represents the degree of clustering of individual student scores about the mean. For example, for the 1974 administration the mean grade equivalent is 3.3 and one standard deviation is 1.3. By definition, approximately two-thirds of the scores fall between +1 and -1 standard deviation units from the mean. In this case therefore, 66% of the scores fall between 2.0 and 4.6.

*** The mean scores achieved by individual schools in the 1972 study and the present one were highly related. The correlation coefficient between the two sets of means was 0.72. As in the 1972 study, we again found that the spread of the scores within any given school was far in excess of the differences among schools.

In terms of their performance on the two administrations of the reading subtest, North York pupils in the sixth month of Grade 3 are achieving, on the average, at about the level expected of typical pupils in February of the Grade 3 year. Achieving within a month or two of the expectation based on the mean score of the norm group is certainly 'comparable' achievement, especially on a test written over the first few days of the month on which the expectation is based.

Further comparisons of our Borough results are detailed in the following table:

TABLE 4

DISTRIBUTION OF SCORES ON M.A.T. READING COMPREHENSION SUBTEST GRADE 3

Raw Score (Items Correct) Max.Score=45	Corresponding Grade Equivalent	% of North York Pupils At or Above Raw Score indicated (1972)	(1974)
36	5.9	6	4
29	4.3	18	20
22	3.4	43	44
16	2.7	67	65
12	2.2	86	84
6	1.4	99	97

It is obvious that a negligible change in the North York distribution of scores from 1972 to 1974 has occurred.

This table reveals further, projecting to the population, that in 1974, on the Reading subtest, 3% of Grade 3 youngsters in this Borough (i.e. about 200 pupils) would score more than two grade equivalent years below the mean, and that 4% (i.e. about 270 pupils) would score more than two grade equivalent years above it.

Grade 5

The analysis of the 1974 Grade 5 results can be related to the Grade 3 results of 1972.

The following table presents borough mean grade equivalent scores and standard deviations for the Reading subtest of the Metropolitan Achievement Test (MAT) administered to Grade 3 pupils in 1972 and Grade 5 pupils in 1974.

TABLE 5

DESCRIPTIVE & COMPARATIVE DATA FOR GRADE 3 PUPILS (1972) AND GRADE 5 PUPILS (1974) ON THE READING SUBTEST OF MAT

Year & Grade	North York Mean	Expected Mean	Standard Deviation	Number Of Pupils	Range Of School Means
1972 Gr.3	3.4	3.5	1.4	1505	2.6 - 4.6
1974 Gr.5	5.6	5.5	1.7	1489	4.6 - 6.7
GROWTH	2.2	2.0	-	-	1.8 - 3.4

In 1972 the Grade 3 North York pupils were achieving at about the expected level for pupils in the sixth month of Grade 3. In 1974 the Grade 5 North York pupils are achieving just above the level expected for students in the sixth month of Grade 5.

Because these two test administrations occurred at the same time during the school year, two years apart, a growth of 2.0 grade equivalent years would be expected. In actual fact, a growth of 2.2 grade equivalent years has been realized.

Grade 6

The following table presents Borough mean grade equivalent scores and standard deviations for the Reading subtest of the Metropolitan Achievement test (MAT), administered to Grade 6 pupils in 1972 and 1974.

TABLE 6

DESCRIPTIVE STATISTICS FOR THE READING COMPREHENSION SUBTEST OF THE M.A.T. GRADE 6 LEVEL

	North York Mean*	Standard Deviation	Number Of Pupils	Range Of School Means**
1972	6.6	1.7	1574	5.7 - 7.9
1974	6.5	1.7	1532	5.4 - 7.5

* The expected mean grade equivalent based on the time of testing is 6.5 .

** The mean scores achieved by individual schools on the 1972 study and the present one were highly related. The correlation coefficient between the two sets of means was 0.70. As in the 1972 study we again found that the spread of the scores within any given school was far in excess of the differences among schools.

TABLE 7

DISTRIBUTION OF SCORES ON M.A.T. READING COMPREHENSION SUBTEST GRADE 6

Raw Score (Items Correct) Max. Score=45	Corresponding Grade Equivalent	% of N.Y. Pupils At or Above Raw Score Indicated 1972	1974
40	9.5	4	5
33	8.7	14	15
36	7.8	23	22
30	6.9	46	51
21	5.1	82	80
18	4.5	88	87
15	4.1	95	94
8	2.4	99	99

The slight drop (6.6 to 6.5) from 1972 to 1974 in the Borough mean Reading score is reflected by the reduced percentages of North York pupils who achieved at or above specified raw scores.

The table also reveals, if we project to the population, that over 15% (i.e. 1090 pupils) of the North York pupils would score more than two grade equivalent years above the Borough mean, and that 13% (i.e.945 pupils) would score more than two grade equivalent years below the mean.

Grade 9

The following table presents Borough mean raw scores and standard deviations for the Reading subtest of the Sequential Tests of Educational Progress (STEP) administered to Grade 9 students in 1972 and 1974.

TABLE 8

DESCRIPTIVE STATISTICS FOR THE READING SUBTEST OF THE STEP GRADE 9 LEVEL

	North York Mean*	Standard Deviation**	Number Of Students	Range Of School Means
1972	41	7	579	34 - 44
1974	37	10	591	31 - 42

* The expected mean raw score based on the fall testing of 2647 American Grade 9's in the norm group is 37. It is acknowledged that this comparison affords some advantage to the North York students.

** The standard deviation is a measure which represents the degree of clustering of individual student scores about the mean. For example, for the 1974 administration, the mean raw score is 37 and one standard deviation is 10. By definition, approximately two-thirds of the scores fall between +1 and -1 standard deviation units from the mean. In this case therefore, 66% of the raw scores fell between 27 and 47.

In terms of their performance on the two administrations of the reading subtest, North

York students in the sixth month of Grade 9 are achieving on the average, at about the level expected of typical American pupils in autumn of the Grade 9 year. However, since the testing was completed not in autumn but in February, it might have been reasonable to anticipate a score more closely resembling that achieved in February, 1972.

The standard deviation, too, is noteworthy, inasmuch as it provides some information regarding the distributions of scores. The smaller standard deviation (i.e. 7) in 1972 suggests that not only did the Grade 9 youngsters attain a higher mean score in the earlier survey, but, as a group, they tended to cluster more tightly around the mean than did the students tested two years later. In 1974, approximately two-thirds of North York's Grade 9 students scored in the range between 27 and 47, while the same percentage of their 1972 counterparts obtained scores between 34 and 48. (As with the mean scores, so this 1974 central distribution bears a striking resemblance to the dispersion of scores achieved by American youngsters in the fall of their Grade 9 year. About 68% of the norm group achieved scores between 26 and 48).

Further comparisons are detailed in the following table.

TABLE 9

DISTRIBUTION OF SCORES ON STEP READING SUBTEST
GRADE 9

Raw Score (Items Correct) Max. Score = 60	% of N.Y. Students At or Above Raw Score Indicated	
	1972	1974
58	1	1
51	14	10
45	34	26
37	60	53
29	88	78
22	97	95

This table indicates that the disparity evidenced earlier between the mean scores of the two North York groups is reflected along the entire range of scores. It is clear that by and large, the Grade 9 students achieved higher scores in 1972 than they did in the 1974 survey. It is worth noting too, that the North York students in both surveys

tended to obtain higher scores than their American counterparts (although, again, the reader should note that as our testing was done during the month of February, students from this Borough do enjoy some advantage when compared with the U.S. sample). Still, projecting to the population, these results suggest that on the STEP Reading subtest, only 5% of Grade 9 youngsters in this Borough (i.e. about 340 pupils) would receive a raw score of 22 or less, whereas 10% of the U.S. students are in this category, using their fall norms. Almost 700 of North York Grade 9 students, moreover, might be expected to score in the top 10th percentile.

Grade 12

The following table presents Borough mean raw scores and standard deviations for the Reading subtest of the Sequential Tests of Educational Progress (STEP) administered to Grade 12 students in 1972 and 1974.

TABLE 10

DESCRIPTIVE STATISTICS FOR THE READING SUBTEST OF THE STEP GRADE 12 LEVEL

	North York Mean*	Standard Deviation**	Number Of Students	Range Of School Means
1972	44	5	465	40 - 47
1974	42	8	531	40 - 45

* The expected mean raw score based on the fall testing of 2383 American Grade 12's in the norm group is 38. It is acknowledged that this comparison affords some advantage to the North York students.

** The standard deviation is a measure which represents the degree of clustering of individual student scores about the mean. For example, for the 1974 administration the mean raw score is 42 and one standard deviation is 8. By definition, approximately two-thirds of the scores fall between +1 and -1 standard deviation units from the mean. In this case, therefore, 66% of the raw scores fell between 34 and 50.

In terms of their performance on the two administrations of the Reading subtest, North York students in the sixth month of Grade 12 are achieving, on the average, somewhat above the level expected of typical American students in autumn of the Grade 12 year. Indeed, even when compared to the spring mean of the norm group (i.e. Raw Score:40) the North York averages tend to be somewhat higher. Nonetheless, it must be acknowledged that, as a group, North York's Grade 12 students performed somewhat less well in 1974 than they did in the earlier survey, two years ago.

The standard deviation, too, is noteworthy, inasmuch as it provides some information regarding the distributions of scores. The smaller standard deviation (i.e. 5) in 1972 suggests that not only did Grade 12 students attain a higher mean score in the earlier survey, but, as a group, they tended to cluster more tightly around the mean than did the students tested two years later. In 1974, approximately two-thirds of North York's Grade 12 students scored in the range between 34 and 50, while the same percentage of their 1972 counterparts obtained scores between 39 and 49.

Further comparisons of our Borough results in 1972 and 1974 are detailed in the following table.

TABLE 11

DISTRIBUTION OF SCORES ON THE STEP READING SUBTEST
GRADE 12

Raw Score (Items Correct) Max. Score=60	% of N.Y. Students At or Above Raw Score Indicated	
	(1972)	(1974)
58	2	1
53	12	11
48	40	26
41	65	61
34	91	87
28	97	96

This table indicates that the disparity evidenced earlier between the mean scores of the two North York groups is reflected along the entire range of scores. It is

clear that by and large, the Grade 12 students achieved higher scores in 1972 than they did in the 1974 survey. (It is worth noting, however, that the North York students in both surveys tended to obtain higher scores than their American counterparts). By extension from this table, for example, only 4% of the Grade 12 students in this Borough (i.e. about 200 students) would attain a raw score of 28 or less. Ten percent of the U.S. students, using spring norms, are in this category.

Section Two: Mathematics Skills

Grade 3

The following table presents Borough mean grade equivalent scores and standard deviations for the Mathematics Computations subtest of the Metropolitan Achievement Test (MAT), administered to Grade 3 pupils in 1972 and 1974.

TABLE 12

MEAN GRADE EQUIVALENTS AND STANDARD DEVIATIONS FOR THE MATHEMATICS COMPUTATION SUBTEST OF THE MAT
GRADE 3 LEVEL

	North York Mean*	Standard Deviation**	Number Of Pupils	Range Of School Means***
1972	3.7	0.9	1522	3.1 - 4.1
1974	3.6	1.0	1461	3.2 - 4.3

* The expected mean grade equivalent based on the time of testing is 3.5

** The standard deviation is a measure which represents the degree of clustering of individual pupil scores about the mean. For example, for the 1974 administration the mean grade equivalent is 3.6 and one standard deviation is 1.0. By definition, approximately two-thirds of the scores fall between +1 and -1 standard deviation units from the mean. In this case therefore, 66% of the scores fall between 2.6 and 4.6.

*** The mean scores achieved by individual schools in the 1972 study and the present one were not very highly related. The correlation coefficient between the two sets of means was 0.35. As in the 1972 study, we again found, however, that the spread of the scores within any given school was far in excess of the differences among schools.

In terms of their performance on the two administrations of the Math Computations subtest, North York pupils in the sixth month of Grade 3 are achieving, on the average, at about the level expected of typical pupils in February of the Grade 3 year.

Further comparisons of our Borough results are detailed in the following table.

TABLE 13

DISTRIBUTION OF SCORES ON M.A.T. MATHEMATICS COMPUTATIONS SUBTEST GRADE 3

Raw Score (Items Correct) Max. Score = 40	Corresponding Grade Equivalent	% of N.Y. Pupils At or Above Raw Score Indicated (1972)	(1974)
32	5.1	6	7
28	4.4	16	17
22	3.8	42	43
17	3.3	73	70
12	2.6	88	89
5	1.6	99+	99

The slight drop (3.7 to 3.6) from 1972 to 1974 in the Borough mean Math score is reflected by the reduced percentages of North York pupils who achieved at or above specified raw scores. In 1972, for example 73% of North York pupils achieved a raw score higher than 17, whereas in 1974, only 70% of our pupils were above this level. Still, it is apparent that only a negligible change in the North York distribution of scores has occurred from 1972 to 1974.

Projecting to the population, it is revealed that in 1974, on the Math subtest, less than 1% of Grade 3 youngsters in this borough (i.e. about 67 pupils) would score two grade equivalent years below the mean, and that 7% (i.e. about 470 pupils) would score almost two grade equivalent years above it.

Grade 5

The analysis of the 1974 Grade 5 results can be related to the Grade 3 results of 1972.

The following table presents Borough mean grade equivalent scores and standard deviations for the Mathematics Computations subtest of the Metropolitan Achievement Test (MAT) administered to Grade 3 pupils in 1972 and Grade 5 pupils in 1974.

TABLE 14

DESCRIPTIVE & COMPARATIVE DATA FOR GRADE 3 PUPILS (1972) AND GRADE 5 PUPILS (1974) ON THE MATHEMATICS COMPUTATIONS SUBTEST OF MAT

Year & Grade	North York Mean	Expected Mean	Standard Deviation	Number Of Pupils	Range Of School Means
1972 Gr. 3	3.7	3.5	0.9	1522	3.1 - 4.1
1974 Gr. 5	6.3	5.5	1.3	1516	5.5 - 7.3
GROWTH	2.6	2.0	-	-	1.9 - 3.3

In 1972 the Grade 3 North York pupils were achieving at about the expected level for pupils in the sixth month of Grade 3. In 1974 the Grade 5 North York pupils are achieving 0.8 G.E. years above the level expected for pupils in the sixth month of Grade 5.

Because these two test administrations occurred at the same time during the school year, two years apart, a growth of 2.0 grade equivalent years would be expected. In actual fact, a growth of 2.6 grade equivalent years has been realized.

Grade 6

The following table presents Borough mean grade equivalent scores and standard deviations for the Mathematics Computation Subtest of the Metropolitan Achievement Test (MAT), administered to Grade 6 pupils in 1972 and 1974.

TABLE 15

DESCRIPTIVE STATISTICS FOR THE MATHEMATICS COMPUTATIONS SUBTEST OF THE M.A.T. GRADE 6 LEVEL

	North York Mean*	Standard Deviation**	Number Of Pupils	Range Of School Mean***
1972	7.2	1.5	1602	6.3 - 8.3
1974	7.4	1.5	1545	6.4 - 8.5

* The expected mean grade equivalent based on the time of testing is 6.5.

** In terms of their performance on the two administrations of the mathematics subtest, North York pupils in the sixth month of Grade 6 are achieving on the average, considerably above the level expected of typical pupils in February of the Grade 6 year.

*** The mean scores achieved by individual schools in the 1972 study and the present one were related. The correlation coefficient between the two sets of means was 0.66. As in the 1972 study, we again found that the spread of the scores within any given school was far in excess of the differences among schools.

TABLE 16

DISTRIBUTION OF SCORES ON M.A.T. MATHEMATICS
COMPUTATION SUBTEST
GRADE 6

Raw Score (Items Correct) Max. Score = 40	Corresponding Grade Equivalent	% of N.Y. Pupils At or Above Raw Score Indicated (1972)	(1974)
36	9.7	4	7
33	8.3	26	29
27	6.8	53	63
21	5.7	84	87
15	4.9	97	97
7	3.6	99+	99

The slight increase (7.2 to 7.4) from 1972 to 1974 in the Borough mean Math score is reflected by the increased percentages of North York pupils who achieved at or above specified raw scores. In 1972, for example, 84% of North York pupils achieved a raw score higher than 21, whereas in 1974, 87% of our pupils were above this level. Generally, however, little change is evident between the distributions of scores over the two-year period.

The table also reveals that 29% of the North York pupils scored almost two grade equivalent years above the expected mean (i.e. 6.5), and that less than 3% of the pupils scored more than two grade equivalent years below the expected mean. When extended to the total Grade 6 population in the Borough, these percentages would suggest that while over 2100 students are achieving at the top end of the scale, only about 200 are at the bottom.

Grade 9

The following table presents descriptive statistics for the Mathematics Computation subtest of the advanced level of the Metropolitan Achievement Tests (M.A.T.), administered to Grade 9 students in 1972 and 1974.

TABLE 17

DESCRIPTIVE STATISTICS FOR THE MATHEMATICS COMPUTATION SUBTEST OF THE M.A.T. GRADE 9 LEVEL

	North York Mean*	Standard Deviation**	Number Of Students	Range Of School Means
1972	9.6	N.A.	580	8.8 - 9.6
1974	9.6	N.A.	576	8.8 - 9.6

* The expected mean g.e. score based on the time of testing is 9.5.

** As the grade equivalent mean reported for Grade 9 students is, in strictly technical terms, less than precise, standard deviations were not calculated in grade equivalent units.

In 1972, the scoring and analysis of tests for Grades 9 and 12 were externally contracted, in order to facilitate and expedite the preparation of the report. After

many delays, the analysis provided was in terms of only raw scores. While this presented problems in neither Grade 9 Reading nor in Grade 12 Reading and Math (where raw score analysis was utilized in the Committee Reports) it necessitated the conversion for Grade 9 Mathematics, of the mean raw score to the corresponding grade equivalent score, a step which provided technically only an approximation of the mean of the individual grade equivalent scores. While it must be acknowledged that this technique tends to work to the advantage of our students' performance levels, it is nonetheless necessary that we duplicate the procedure in order to provide the requested comparisons between achievement in Mathematics Computation in 1972 and 1974.

Nor is it an entirely unreasonable procedure when examining the Grade 9 results of a subtest yielding a maximum grade equivalent score of 9.9: the test is simply less discriminating at the upper extreme. Basing the analysis on a raw score comparison does serve to accommodate the potential "topping" or "ceiling effect" on the scores of the many above-average students in the sampling.

In terms of their performance on the two administrations of the reading subtest, North York students in the sixth month of Grade 9 are achieving on the average, at about the level expected of typical students at this stage of the Grade 9 year.

Further comparisons of our Borough results in 1972 and 1974 are detailed in the following table.

TABLE 18

DISTRIBUTION OF SCORES FOR THE MATHEMATICS COMPUTATIONS SUBTEST OF THE MAT - GRADE 9 LEVEL

Raw Score (Items Correct) Max. Score=40	Corresponding Grade Equivalent	% of N.Y. Students At or Above Raw Score Indicated (1972)	(1974)
38	9.8	6	12
36	9.8	20	26
30	9.2	59	65
22	7.3	83	89
16	6.0	99+	98
7	3.9	99+	99+

This table reveals a modest shift in the distribution of scores towards those at the upper end of the scale. In 1972 only 20% of our Grade 9 students obtained a raw score of 36 or higher on this 40 item test. In 1974 26% of the sampling did so.

The table reveals also that the percentage of North York Grade 9 students who score more than two years below the expected grade equivalent mean has dropped from 17% to 11%. Extending this to the Borough's Grade 9 population would suggest a drop from 1972 to 1974 of over 400 youngsters whose computational skills are more than 2 grade equivalent years below the norm.

Grade 12

The following table presents descriptive statistics for the mathematics subtest (i.e. Part II) of the School and College Ability Tests (SCAT) administered to Grade 12 students in 1972 and 1974.

TABLE 19

DESCRIPTIVE STATISTICS FOR SCAT 2A, PART TWO
GRADE 12 LEVEL

	North York Mean*	Standard Deviation**	Number of Students	Range of School Means
1972	37	7	467	34 - 38
1974	36	7	530	33 - 37

*The expected mean raw score on this 50-item subtest, based on the fall testing of 3133 American Grade 12's in the norm group, is 32. It is acknowledged that this comparison affords some advantage to the North York students.

**The standard deviation is a measure which represents the degree of clustering of individual student scores about the mean. For example, for the 1974 administration the mean raw score is 36 and one standard deviation is 7. By definition, approximately two-thirds of the scores fall between +1 and -1 standard deviation units from the mean. In this case, therefore, 66% of the raw scores fall between 28 and 43.

In terms of their performance on the two administrations of the SCAT mathematical subtest, North York students in the sixth month of Grade 12 are achieving, on the average, somewhat above the level expected of typical American students in autumn of the Grade 12 year. As might well be expected in view of the February testing. As a group, North York Grade 12 students performed about as well in 1974 as they did in the earlier survey, two years ago.

The standard deviation, too, is noteworthy, inasmuch as it provides some information regarding the distribution of scores. The identical standard deviation (i.e. 7) would suggest that the distribution of scores changed little from 1972 to 1974.

Further comparisons of the distribution of our Borough results in 1972 and 1974 are detailed in the following table.

TABLE 20

DISTRIBUTION OF SCORES ON THE SCAT 2A, PART TWO, SUBTEST
GRADE 12 LEVEL

Raw Scores (Items Correct) Max Score = 20	% of N.Y. Students At or Above Raw Score Indicated	
	(1972)	(1974)
44	13	14
40	37	35
34	71	69
27	90	92
20	98	97
13	99+	99+

This table indicates that the similarity evidenced earlier between the mean scores of the two North York groups is reflected along the entire range of scores. It is clear that by and large, the grade twelve students achieved similar scores in 1972 to those they achieved in the 1974 survey. (It is worth noting, too, that the North York students in both surveys tended to obtain higher scores than their American counterparts.)* By extension from this table, for example, only 3% of the Grade 12 students in this Borough (i.e. about 150 students) would attain a raw score of 20 or less. Ten percent of the U.S. students, on the basis of fall norms, are in this category. Moreover, almost five times that number of North York Grade 12 students might be expected to score in the top tenth percentile.

*The reader is again reminded that, as testing in North York was completed during February, four months after the norm sample, North York students are therefore at some advantage when compared with the U.S. Sample.

SUMMARY

The preceding results may be summarized as follows:

(A) In General

1. North York achievement in both reading and mathematics compares favourably with the American norms in all grades tested.

2. Average growth over the two years from grade 3 to grade 5 was above that expected in both reading and mathematics.

(B) In Reading

1. Grade 9's, 1974 results indicate an average drop of 10% from the raw score mean obtained in 1972. This corresponds to a drop of about 14 percentile points. There were, too, very slight drops in grades 3,6, and 12.

2. There has been a very slight increase since 1972 in the numbers of youngsters scoring at the low end of the scale.

(C) In Mathematics

1. The 1974 average achievement in mathematics compares favourably with the results of the 1972 testing.

2. In terms of the distribution of scores, there has been either no change between 1972 and 1974, or a decrease in the numbers of youngsters scoring at the low end of the scale

3. Something of a 'spurt' is evident in the growth pattern of mathematics students. In both 1972 and 1974 they appear to be at the norms in grade 3, then to grow at a rate faster than that of the norm group by grade 5. While they maintain the increase in grade 6, they are back down to the level of the norm group in grade 9. By grade 12 they are again above the norm group.

These results are also presented in summary form in the following table.

TABLE 21

SUMMARY OF RESULTS

Grade		READING			MATHEMATICS		
		"A" Mean Raw Score	"B" Mean 'Standard' Score	"C" Expectation Corresponding to "B"	"D" Mean Raw Score	"E" Mean 'Standard' Score	"F" Expectation Corresponding to "E"
3	1972	22*	3.4		21***	3.7	
	1974	21*	3.3 g.e.	3.5 g.e.	20***	3.6 g.e.	3.5 g.e.
5	1974	24*	5.6 g.e. (1)	5.5 g.e.	25***	6.3 g.e. (2)	5.5 g.e.
6	1972	31*	6.6		28***	7.2	
	1974	30*	6.5 g.e.	6.5 g.e.	30***	7.4 g.e.	6.5 g.e.
9	1972	41**	63rd %ile		31***	9.6	
	1974	37**	49th %ile (fall)	> 50th %ile	31***	9.6 g.e	9.5 g.e.
12	1972	44**	59th %ile		37****	68th %ile	
	1974	42**	53rd %ile (spring)	<50th %ile	36****	65th %ile (fall)	< 50th %ile

*on 45-item subtest
**on 60-item subtest
***on 40-item subtest
****on 50-item subtest

29

(1) The mean g.e. score of 5.6 obtained by grade 5 pupils represents a gain of 2.2 over the mean Reading score obtained by approximately the same group two years earlier. This compares favourably with an expected growth of 2.0 g.e. units.

(2) The mean g.e. score of 6.3 obtained by grade 5 pupils represents a gain of 2.6 over the mean Math Computation score obtained by approximately the same group two years earlier. This compares favourably with an expected growth of 2.0 g.e. units.